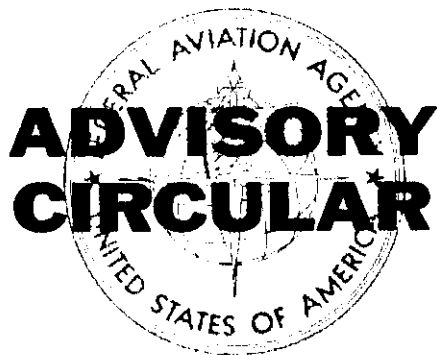


Federal Aviation Agency

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AC NO : AC 21-1

CERTIFICATION PROCEDURES
FOR PRODUCTS AND PARTS

EFFECTIVE :

6/15/65

SUBJECT : PRODUCTION CERTIFICATES

1. **PURPOSE.** This circular is to provide information concerning Subpart G of Federal Aviation Regulations (FAR) Part 21, and to set forth acceptable means of compliance with its requirements. The material presented herein is intended for guidance and information only.
2. **CANCELLATIONS.** Civil Aeronautics Manual (CAM) Sections 1.30-1 through 1.45-1.
3. **REFERENCE.** FAR, Parts 1, 13, 21, 43, 45, and 183.
4. **DEFINITIONS.** As used herein, the following definitions apply:
 - a. **Article.** A material, part, component, assembly, or appliance which is used in the type certificated product, as specified in the type design.
 - b. **Supplier.** Any person who furnishes services to a holder of a production certificate which affect a type certificated product, or who supplies articles for installation on a type certificated product.
 - c. **Regional Office.** The Engineering and Manufacturing Branch of the Federal Aviation Agency region in which the prime manufacturer is located. (In the Western Region, the Aircraft Engineering Division.)
 - d. **District Office.** The FAA Engineering and Manufacturing District Office (EMDO) responsible for evaluation and inspection of the prime manufacturer's facilities. (In the Western Region, the Aircraft Engineering District Office (AEDO).)
5. **DISCUSSION.** This circular will cover only those sections of Subpart G where further discussion, information, and examples would be helpful. The heading of each of the following main paragraphs refers to the applicable section of Subpart G.

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- a. FAR 21.133 Eligibility. An application for a production certificate is made on FAA Form 332, Application for Production Certificate, which is submitted to the Regional Office.
- b. FAR 21.139 Quality Control. A quality control system meeting the requirements of FAR 21.139 would normally provide control over all phases of manufacture. The following paragraphs provide an example of a quality control system considered to be an acceptable means of compliance with FAR 21.139.
 - (1) Organization. The organization of the quality control department would ensure that any decisions with regard to workmanship, quality, conformity, safety, materials review, and corrective action are not unduly influenced by other considerations. This can generally be achieved by having the quality control department report directly to top management.
 - (2) Inspection Planning. The establishment of an inspection planning system would provide the means for selecting and controlling procedures governing methods for:
 - (a) Classifying design characteristics and related manufacturing defects of all articles, processes, services, and the completed product, so that the most effective fabrication inspection methods and process controls will be used with respect to critical and major characteristics and defects. (Reference FAR 21.93, MIL-STD-105, and MIL-STD-414.)
 - (b) Selection of appropriate inspection methods and plans for each article to ensure that all characteristics affecting safety will be inspected, and reinspected as required, to ensure conformity to approved design data and to eliminate discrepancies from completed products and spare parts.
 - (c) Ensuring that any defects which might be in a lot accepted under a statistical quality control plan will not result in an unsafe condition in an end product or spare part.
 - (3) Inspection Personnel. An effective quality control system utilizes well qualified inspectors in sufficient number to ensure that all articles, processes, procedures, and the completed products are inspected for conformity to data, specifications, and procedures specified by the type design.
 - (4) Inspection Stations. The location of inspection stations at each stage of production ensures that parts, assemblies, processes, and assembly operations are inspected, and appropriate tests are conducted, in accordance with data, technical material, and records maintained at the station, at that particular stage of production.

- (5) Production Planning. Production planning is usually achieved through use of fabrication and inspection instructions, shop travelers, check lists, or similar media, which not only provide control over fabrication and assembly operations, but also ensure that necessary inspections and tests will be conducted in the proper sequence, when articles and processes are in an inspectable condition, prior to painting or closures. Such a system would provide for inspections and tests appropriate to all phases of the production cycle, from raw materials and related processes and services to the completed product.
- (6) Inspection Status. A means of ensuring that only those articles and services which have been inspected and found to conform to FAA approved design data are used in the product, is to appropriately identify articles with stamps or marks, generally traceable to the individual inspector. For example:
- (a) Suitable acceptance, rework, or rejection stamps would be placed on articles subjected to processing, testing, or inspections, such as, heat-treat, welding, soldering, brazing, bonding, hardness tests, laboratory analysis, radiographic inspection, ultrasonic inspection, magnetic particle inspection, etc.
 - (b) Articles which have been reworked and accepted as a result of approved materials review action would be so identified by a suitable stamp.
 - (c) Articles rejected as being unusable or scrap or rendered obsolete by service bulletins or airworthiness directives would be plainly marked and subsequently controlled so as to absolutely preclude either their installation on the product or their use as spare parts.
- (7) Materials Review. A materials review system is normally of prime importance in any quality control system, since it provides the means to:
- (a) Control the identification, rework, and use of damaged or nonconforming articles, including the isolation and scrapping of unusable articles.
 - (b) Ensure the submittal of all materials review actions to the FAA for engineering approval prior to final acceptance or delivery of affected products or articles, when the action results in a nonconformity of the product with the approved type design.

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- (c) Provide for corrective action with regard to discrepancies in manufacturing procedures, processes, design, or any other condition which caused the nonconforming articles, to ensure that all affected and subsequent products and articles will be in conformity with the type design.
- (d) Maintain charts or records to show the effectiveness of the corrective action program and to reveal problem areas as they arise.
- (8) Inspection Records. To preclude misunderstandings concerning inspections and tests conducted by or on behalf of the holder of a production certificate, the usual practice is to document all inspections and tests conducted during manufacture of each individual product and article, and to retain such records for several years.
- (9) Facilities and Equipment. A minimum of rejection and rework is one good indication that manufacturing facilities, equipment, and tooling are adequate to ensure production of uniform, duplicate articles and completed products.
- (10) Fabrication and Assembly. It is in the interest of good shop practice leading to a quality product to have production areas arranged to provide segregation of manufacturing processes or operations which may adversely affect other operations; for example, separation of precision inspection areas from areas where grinding, cutting, sanding, or painting operations are performed.
- (11) Technical Data Control. The use by production and inspection personnel of up-to-date technical data contributes towards the manufacture of a product which conforms to appropriate design provisions; therefore, it is the normal practice to maintain a technical data control system which ensures that only the latest FAA approved drawings, drawing change notices, engineering data, and quality control data are available to production and inspection personnel, and that obsolete drawings and data are promptly removed from production areas.
- (12) Drawing Change Control. A drawing change control system is an important factor which assists in ensuring that prior to final acceptance of products or articles, all changes to the type design are either incorporated in the applicable drawings, or described in change notices attached to such drawings.
- (13) Process Control. The integrity of processes and services utilized in the construction of articles and products is usually dependent upon the skill with which the work is

performed, the capabilities of the equipment used, and close control of temperatures, solutions, curing time, or other critical factors. Normally, a system to control all processes and services, such as welding, brazing, heat treatment, plating, and radiographic, ultrasonic, or magnetic particle inspection, etc., ensures that each process is performed by trained and qualified personnel and in accordance with approved specifications containing definitive standards of quality, and that periodic inspection of gauges, solutions, or any critical equipment is controlled and documented.

- (14) Tool and Gauge Control. Tools, gauges, jigs, and fixtures used for precision inspection, process control, and production contribute to the manufacture of uniform products; however, these media lose their effectiveness when they are inaccurate. To preclude acceptance of nonconforming articles, or rejections due to misfits or improperly controlled processes, a quality control system usually incorporates a schedule for inspection and calibration, to certified national measurement standards, of all inspection tools, gauges, testing equipment, as well as production jigs, fixtures, templates, etc., which are depended upon as media for inspection. An acceptable schedule would have the inspection intervals established on the basis that such tools and gauges would be inspected prior to their becoming inaccurate, or requiring adjustment, replacement, or repair. A recordkeeping system would ensure that each piece of equipment is:
- (a) Checked prior to first usage and at the proper periodic interval, and marked to indicate the date that the next inspection is due, and is:
 - (b) Removed from inspection and shop areas or conspicuously identified to prohibit usage after expiration of the inspection due date.
- (15) Purchasing and Receiving. An effective purchasing and receiving inspection system is generally considered to be of prime importance in any quality control system, since it precludes release to production of nonconforming or unsafe articles procured from outside sources. Normally, such a system would ensure that:
- (a) Purchase orders provide specifications or other data in the detail necessary to ensure procurement of articles or services which meet the requirements of the type design.
 - (b) All incoming articles conform to approved type design data prior to their acceptance and release to production.

- (c) Proprietary articles are of the same design configuration, as specified in the approved type design. (Reference 5b(16)(c)).
 - (d) Records are maintained of all inspections and tests performed by or for the holder of a production certificate in controlling the design configuration and conformity of all supplier furnished articles.
 - (e) All articles and related inspection and test records are identified with appropriate acceptance, rejection, or rework stamps. (Reference paragraph 5b(6)).
- (16) Suppliers. Since the holder of a production certificate is primarily responsible for each article used in his product, it is to his advantage to establish a system to ensure conformity to the type design of all articles or services obtained from suppliers. Such a system would normally ensure that:
- (a) Inspections and tests are extended to include suppliers of articles or services which cannot or will not be completely inspected upon receipt by the holder of a production certificate at his approved facilities.
 - (b) Provisions are made for the evaluation and surveillance of suppliers by the holder of a production certificate when he relies to any degree upon a supplier's quality control system, or has delegated inspection duties to the supplier.
 - (c) All materials review actions and design changes made by suppliers, including suppliers of articles over which the holder of a production certificate does not exercise design control, are evaluated by the holder of a production certificate and approved as applicable in accordance with FAR 21, Subpart D.
 - (d) Positive control is exercised to ensure conformity to approved design data and functioning of all articles obtained from suppliers who hold an FAA type and production certificate, technical standard order (TSO) authorization, modification or replacement parts approval, or an appropriately rated repair station certificate for the article involved.
 - (e) Suppliers to whom the holder of a production certificate has delegated inspection duties, or those on whom he relies for controlling conformity and quality, are formally advised

that their facilities, system, data, equipment, personnel, and articles being supplied are subject to evaluation and inspection by the FAA, since, in effect, such suppliers facilities constitute extensions of the facilities of the holder of a production certificate.

- (f) Articles obtained from foreign suppliers are under the same degree of control that is exercised over domestic suppliers. Normally, the Agency considers no undue burden is placed upon the U.S. in administering the regulations regarding foreign suppliers when:

- 1 A reciprocal airworthiness agreement, as described in FAR 21.29(a) is in effect between the United States and the country in which the foreign supplier is located;
- 2 The foreign civil air authority, through negotiation with the FAA, agrees to:
 - a Perform inspections and surveillance on behalf of the FAA, and,
 - b Prior to issue of the production certificate, certify to the FAA that each article is airworthy and conforms to type design data.

- (17) Storage and Issuance. Experience has shown that a reliable, well-controlled storage and issuance system is a major factor in production of a conforming and safe product. Such a system would normally ensure:

- (a) Identification, segregation, and protection of articles in storage;
- (b) Periodic reinspection and disposition of materials subject to deterioration from prolonged storage;
- (c) Protection from damage of articles being delivered to fabrication or shipping areas and while stored in fabrication areas prior to use;
- (d) Incorporation of all applicable design changes prior to release of stored articles for installation in the product.
- (e) That only those articles which are identified as having passed company inspection are received into and issued from finished stores.

(18) Final Assembly and Test.

- (a) The final assembly inspections are of particular importance, since, together with quality control exercised throughout the manufacturing cycle, it is at this point that the airworthiness and safety of the product is ultimately determined. An acceptable quality control system would, therefore, normally incorporate procedures to ensure that:
- 1 Each completed product is subjected to a final inspection for completeness, adjustments, safetying, calibration, markings, placards, etc., in accordance with the applicable configuration of the approved design data for the product and model involved. Also, that each completed product is inspected for freedom from damage, contamination, and for safe operating condition.
 - 2 The means provided for leveling an aircraft are accurately installed, and that the empty weight and center of gravity of each completed aircraft is accurately determined. The holder of a production certificate may submit, for FAA consideration, a proposal based on a reliable statistical plan and evidence of product uniformity, if he desires to utilize an average empty weight and center of gravity, in lieu of weighing each aircraft.
 - 3 The aircraft equipment list and, when applicable, loading charts and instructions are accurate.
- (b) In conjunction with the final inspections, it is normal procedure to conduct functional tests of each completed product, to determine whether the operating characteristics meet the approved design provisions. Examples of the type of tests generally found to be acceptable are as follows:
- 1 Each completed aircraft would be subjected to a flight test in accordance with flight test procedures and checkoff lists developed from operating characteristics and data which were found to comply with the applicable airworthiness regulations during the type test evaluation program, and approved as a part of the quality control data.
 - 2 Except as noted in paragraph c below, each completed engine would be subjected to a test run, including:

- a Break in runs to determine fuel and oil consumption and to determine that maximum power characteristics are as specified in the type design data.
 - b Internal inspection as necessary to determine that the engine is in condition for safe operation. The degree of such inspection may be on a statistical sampling plan, based on evidence of product uniformity, a satisfactory history of previous internal inspections, and service experience.
 - c The test firing of a sufficient number of rocket engines, selected from production lots in accordance with statistical sampling plans included in the prime manufacturer's quality control data, which, together with a close control of materials and processes, would ensure that each engine in the lot functions properly and develops its rated thrust for the time specified in the approved type design data.
 - 3 Each completed variable pitch propeller would be functionally tested to determine that it operates freely and smoothly throughout the normal range of operation and with maximum and minimum operating forces alternately applied, according to design and installation requirements.
- (19) Shipping. A system established to control the packing, preservation, and condition of spare articles normally incorporates procedures which ensure that:
 - (a) Spare articles conform to applicable type design data and have not exceeded their shelf life limits.
 - (b) Prior to shipment of spare articles, all required modifications are accomplished in accordance with applicable design changes, service letters or bulletins, or FAA airworthiness directives.
 - (c) Spare articles are lubricated, preserved and packed in a manner to preclude corrosion or damage in shipment - especially internal damage not readily detectable by inspection for condition upon receipt.
- (20) Domestic Delivery of Unassembled Aircraft. When a holder of a production certificate authorizes any person to assemble, inspect, and flight test aircraft delivered unassembled, such person is, in effect, a supplier performing a service for the holder of the

production certificate. The holder of the production certificate may delegate to such persons duties with respect to empty weight and center of gravity determinations, flight tests, and other inspections or tests, in accordance with approved data, checklists, and procedures.

c. FAR 21.143 Quality Control Data Requirements, Prime Manufacturer.

- (1) The data required to be submitted for approval under this regulation should be submitted to the district office.
(Reference paragraph 5(a)).
- (2) In general, the requirements of FAR 21.143 are self-explanatory and the following paragraphs provide an example of acceptable compliance:
 - (a) The data would be arranged in manual form, with a suitable index, and with chapters covering each section of FAR 21.143.
 - (b) The descriptive material would normally include all of the items discussed under paragraph 5b of this circular.
 - (c) When references to other company documents or data are utilized, the manual would briefly summarize the procedure, method, or system which is referenced. Any such referenced material becomes part of the data approved by the FAA.
 - (d) In providing the description required by FAR 21.143(a)(3), the inclusion of supplementary data such as the following is normally considered helpful in showing acceptable compliance:
 - 1 Copies of all inspection and acceptance forms and checklists for articles and completed products, together with a brief outline of instructions for their use.
 - 2 Imprints of the various inspection and process stamps, and their meaning.
 - 3 A schedule of inspection and calibration intervals for production jigs and fixtures, precision inspection tools, testing equipment, including gauges, and recording equipment used in controlling processes.
 - 4 A listing of manufacturing processes which are relied upon to assure quality, conformity, and safety of the completed product.
- (3) An acceptable means of compliance with FAR 21.143(b) would be to provide in the quality control manual, a description of the system used to monitor and control domestic and foreign

suppliers to whom the holder of a production certificate has delegated authority (Reference FAR 21.143(a)(1) and 21.143(a)(2)). Such a description would usually include an up-to-date listing, either in the manual or in a referenced company document, of all such suppliers by name, address, nomenclature of articles or services, drawing numbers, approved drawing changes, and any other pertinent information, for example:

- (a) Preliminary materials review and design change authority granted.
- (b) Quality control and testing functions delegated.
- (c) Surveillance exercised by the production certificate holder.
- (d) The place where inspection and testing functions will be conducted by the holder of a production certificate if such functions are not delegated.

d. FAR 21.147 Changes in the Quality Control System.

- (1) An acceptable means of compliance with the notification requirements of this regulation is to notify the district office of changes falling within the scope of the regulation.
- (2) Whenever changes in the quality control system result in the necessity for revision of the quality control data, an acceptable means for obtaining approval of such revisions would be to provide, with the notification, revised quality control data or supplementary information as may be required, for review and approval by the district office.

e. FAR 21.151 Production Limitation Record. The production certificate may not always authorize production of every model listed on the type certificate. Since the Production Limitation Record (PLR) is the only means provided by the regulations for denoting each specific product; therefore, the FAA will list on the PLR, in addition to the type certificate, each model authorized for manufacture under the production certificate, and the date of such authorization.

f. FAR 21.153 Amendment of the Production Certificate.

- (1) Application to amend a production certificate is in the same form and manner as the original issue, except that only changes to the existing quality control data need be submitted, when production of the new product involves changes in the quality

control system. If no changes in the quality control data are required, it is helpful to document the situation by letter to the district office (Reference paragraphs 5a and 5c(1) of this circular.)

- (2) Since a production certificate may be amended for several different purposes, the following paragraphs provide examples as to methods applicable in differing circumstances:
 - (a) When the holder of a production certificate makes application to add a new type certificate, new model, or a supplemental type certificate (STC) to his production certificate, upon evaluation and approval of the quality control data and manufacturing facilities, as applicable, the FAA will issue a superseding production limitation record, which would automatically cancel the existing one, except that, STC's which are referenced in and become a part of the approved type design data will not be listed on the production limitation record.
 - (b) When production of complete products as well as spare articles has ceased, the holder of a production certificate may request deletion of a type certificate from a production limitation record by a letter to the Regional Office. A revised production limitation record will be issued, and the superseded production limitation record would be cancelled.
 - (c) If the holder of a production certificate ceases to manufacture complete products, but continues to manufacture spare articles, his production limitation record does not require amendment.

g. FAR 21.157 Inspections and Tests.

- (1) Upon receipt of the Application for Production Certificate, FAA Form 332, and following a district office preliminary survey and evaluation of the applicant's quality control system and data, the FAA may convene a production certification board at the applicant's facilities to make the final determination for issue of a production certificate. The applicant will be formally advised as to the extent of his assistance needed in the production certification board activities, and of the findings and recommendations of the district office and the production certification board.
- (2) Following issue of the production certificate, the FAA will maintain periodic surveillance of the production facilities and

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quality control system, make spot inspections and tests of individual articles and completed products, review related records and will conduct other investigations as necessary to determine whether the holder of the production certificate continues to comply with the requirements for a production certificate. If such inspections or tests disclose that any part of the data or system which was originally approved does not fully meet the applicable requirements, the FAA may request changes to the quality control system or data as may be required.

- (a) The FAA considers that inspection stamps, signatures, or any other evidence of inspection approval, placed on inspection records, test reports, or physical articles are documentation that the article, process, or manufacturing operation has been accepted by the holder of a production certificate.
 - (b) If an article has passed through a point officially designated for inspection, the omission of any required stamps or signatures, which were designated to be applied at that point to the physical article, inspection records, or test reports, may be considered a noncompliance with approved quality control data and procedures.
- h. FAR 21.161 Display. Since the production limitation record (PLR) is part of the production certificate, it should be displayed with the production certificate. The holder of a production certificate may make copies of the production certificate and PLR for display in offices of outlying plants which are part of the main manufacturing facilities.
- i. FAR 21.163 Privileges. The holder of a production certificate may also:
 - (1) Obtain the appointment of individuals in his employ as Designated Manufacturing Inspection Representatives (DMIR) for the purpose of issuing airworthiness certificates and related approvals. (Reference FAR, Part 183.)
 - (2) Apply for Delegation Option Authorization, if the product he is producing qualifies under FAR 21.231.
- j. FAR 21.165 Responsibility of the Holder.
 - (1) The holder of a production certificate has basic responsibility for controlling the manufacture of completed products in conformity with his FAA approved quality control data and type design requirements. Although this responsibility never changes, he may be relieved of some of the burden of inspection and testing duties when he:

- (a) Uses other type certificated products manufactured under another person's production certificate, or which bear an FAA Airworthiness Approval Tag, FAA Form 186.
 - (b) Uses articles produced under an FAA TSO authorization.
 - (c) Installs used articles overhauled or repaired under an FAA Repair Station Certificate.
 - (d) Uses articles fabricated under an FAA Parts Manufacturing Approval.
 - (e) Delegates specific duties to other suppliers.
- (2) Even though the holder of a production certificate may be relieved of some of the burden of inspection and testing when a supplier holds an FAA approval, the production certificate holder remains responsible for controlling the design, physical configuration, and safe operating condition of the articles or products furnished by such a supplier. One means of exercising such control is to utilize articles or products whose specific design configurations were found to comply with the applicable airworthiness regulation, as substantiated during the type test program, and by requiring that all changes made by a supplier, to the design or the physical product or article, are submitted to the holder of the production certificate for evaluation and approval as applicable under FAR 21, Subpart D. Thus the holder of a production certificate is responsible for obtaining FAA approval of design changes or materials review actions made to supplier furnished articles which would also result in a change to his type design or to his products. A supplier who holds an FAA approval is also responsible when articles or services furnished by him:
- (a) Do not conform to the supplier's FAA approved design data;
 - (b) Were not manufactured or overhauled in accordance with the supplier's FAA approved quality control data or repair station inspection procedures manual;
 - (c) Contain any other defects which normally would not be found by the prime manufacturer in conducting his receiving inspections and functional tests and which would result in an unsafe product.
- (3) Completed products are considered to be submitted for airworthiness certification or approval when an engine or propeller is released for shipment or in the case of an aircraft

when any one of the following documents, as applicable, is completed, dated, signed, and submitted to an FAA representative.

- (a) Application for Airworthiness Certificate, FAA Form 305;
- (b) Conformity Certificate - Military Aircraft, FAA Form 970;
- (c) Application for Export Certificate of Airworthiness, FAA Form 306.


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